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Shifting Parental Age Differences in High-Income Countries: Insights and Implications

CHRISTIAN DUDEL , YEN-HSIN ALICE CHENG 
AND SEBASTIAN KLÜSENER 

Age differences within couples are of considerable importance for the power relations between partners. These age differences become particularly relevant when couples transition to having a(nother) child, as such an event often results in a renegotiation of the gendered division of labor. Surprisingly, the literature on female empowerment and fertility postponement has so far paid little attention to parental age differences. This paper makes use of a new data set to present a demographic analysis of trends in parental age differences at childbirth in 15 high-income countries, covering a period in which all of these countries experienced changes in gender relations and fertility postponement. The general trends in rising mean ages at childbirth have evolved quite similarly among men and women. However, we demonstrate that these similarities hide previously unexplored and highly gendered disparities in parental age differences. Older mothers report much smaller mean parental age differences than younger mothers, and this age pattern among mothers has further polarized over time. By contrast, older fathers report larger parental age differences than younger fathers, while the disparities by age among fathers have not changed much over time. We discuss the relevance of our findings at both the individual and the societal level.

Introduction

Over the last decades, many high-income countries have witnessed changes in gender relations (Goldscheider, Bernhardt, and Lappegård 2015) as well

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as in family formation and fertility patterns (Esteve, García-Román, and Permanyer 2012; Lesthaeghe 2014). These changes have been accompanied by increasing labor force participation among women and postponement of fertility to later ages (Fox, Klüsener, and Myrskylä 2018; Kohler, Billari, and Antonio 2002; Sobotka 2004). All these gender- and family-related changes have strong interdependencies; for example, the increasing labor force participation of women has implications for dyadic power relations within couples, and for how women bargain for the division of labor within the family (Ott 1992).

Among the demographic aspects that influence power relations within couples are age and parental age differences (e.g., Presser 1975; Pyke and Adams 2010). In many societies around the globe, the mean paternal age at childbirth is several years higher than the mean maternal age at childbirth (Schoumaker 2019; Dudel and Klüsener 2021). This pattern tends to give fathers an advantage over mothers when bargaining over the division of labor after children are born, as fathers have generally had longer time than mothers to establish themselves on the labor market. From this perspective of power and gender relations, the postponement of fertility can be seen as an opportunity for women to obtain additional education and to become more established in the labor market before having children. This strategy tends to provide women with more bargaining power at the couple level and higher economic independence from their male partner. While wanting enhanced economic security is one potential motive for women to choose an older male partner (Presser 1975; Pyke and Adams 2010), such a motive tends to be less relevant for women with high levels of economic independence. For these women, age homogamy might be more appealing, as it decreases the likelihood that their partnership will be characterized by unequal power relations (Dribe and Stanfors 2017). Thus, shifts in age differences among parents likely not only signify but also shape evolving gender power relations in societies in which the status of women has been advancing rapidly (Cheng and Kolk 2021; Dudel and Klüsener 2021; Kolk 2015).

Against this background, it is surprising that the rich literature on contemporary female empowerment and fertility postponement has paid little attention to trends in parental age differences. Previous demographic work on assortative mating patterns by age, education, race/ethnicity, and social status has focused on marriages and looked at the implications of these patterns for social inequalities and mobility (Blossfeld 2009; Blossfeld and Buchholz 2009; Kalmijn 2013; Nitsche et al. 2018; Qian and Lichter 2007). This research has shown that there has been a long-term decline in age differences between husbands and wives since the beginning of the 20th century and that age-homogamous unions have become more common in various contexts (Esteve, Cortina, and Cabré 2009; Van Poppel et al. 2001). However, the much-studied data series on the age pairings of spouses at marriage is becoming less relevant for understanding age differences among

parents, as cohabitation is becoming increasingly prevalent in many high-income countries, and many of these couples are having children (Billari and Liefbroer 2010; Perelli-Harris et al. 2010). In addition, the findings from the rich literature on age pairings among couples might not be indicative of levels and trends in parental age differences at childbirth if the age differences within couples affect whether they have children and how many children they have.

In this paper, we aim to close existing gaps in the literature by using a comparative perspective to study trends and heterogeneity in parental age differences at childbirth. A particular focus is put on differences between younger and older mothers, which is an understudied phenomenon. We analyze high-quality vital registration data from 15 high-income countries in Europe, North America, and East Asia over a time span of several decades, with the longest time series starting in the late 1960s. The results of our demographic investigation of postponement trends show that the mean ages at childbirth have evolved quite similarly for men and women. However, these findings hide sharp differences between mothers and fathers. Among mothers, the average parental age difference decreases with maternal age; that is, the age difference tends to be smaller for older mothers than for younger mothers. This pattern has further polarized over recent decades, with the average parental age difference increasing among younger mothers and decreasing among older mothers. Among fathers, by contrast, the average parental age difference increases with paternal age at childbirth. Moreover, this pattern has evolved differently compared to mothers. Among fathers, the magnitude of the decline in the average parental age difference has been very similar across all paternal ages at childbirth. Thus, in contrast to the mothers, no polarization trend is observed among fathers. Our cross-country comparison shows that the patterns among women and men are quite similar across the 15 high-income countries we analyze.

We also find that among mothers between ages 20 and 40, there is an almost linear relationship between the maternal age at childbirth and the parental age difference, which has tilted over time as parental age differences have become increasingly polarized by maternal age. Our outcomes suggest that maternal age at childbirth has become a marker of gender power constellations within couples, as older mothers are increasingly likely to be partnered with a similarly aged partner, while younger mothers are increasingly likely to be substantially younger than their partner.

Our paper contributes to the existing literature in several ways. We provide the first systematic demographic cross-country analysis of parental age differences over time. In doing so, we present evidence of increasing polarization in parental age differences between younger and older mothers. We link this finding to the discussion on polarization trends in fertility postponement by socioeconomic status and migration background (e.g., Lima et al. 2018; Burkimsher 2017). In addition to providing results for

mothers, we also present results for fathers, who are often overlooked in research on fertility. The findings for fathers differ substantially from those for mothers. Moreover, to study age differences conditional on maternal age, we employ a novel regression approach. This regression approach summarizes conditional age differences in two parameters that are easy to understand: the mean parental age difference for young mothers/fathers, and heterogeneity across the maternal or the paternal age range. We also present theoretical considerations regarding the mechanisms that might underlie the identified patterns and discuss the relevance of our findings at both the individual and the societal levels. Our results and theoretical considerations point to promising avenues for future research on these understudied patterns and trends, which are of high relevance for the discussion on fertility postponement, gender inequalities, and the prospects of the gender revolution (e.g., Esping-Andersen and Billari 2015; Goldscheider, Bernhardt, and Lappegård 2015).

Background

Age differences in couples: Men tend to be older

A finding consistent across the literature on age differences between partners in heterosexual couples is that, on average, the male partner is older than the female partner. Age differences between partners have been studied for several contexts, such as age differences at marriage (e.g., Gustafson and Fransson 2015; Esteve, Cortina, and Cabré 2009; Hancock et al. 2003; Van Poppel et al. 2001), at childbirth (e.g., Dudel and Klüsener 2021; Schoumaker 2019; Kolk 2015), or while dating (e.g., Grøntvedt and Kenair 2013; Skopek et al. 2011), among others. Individual preferences regarding age differences have also been extensively studied (Conroy-Beam and Buss 2019), such as preferences based on behaviors on online dating platforms (e.g., Hitsch, Hortaçsu, and Ariely 2010). All these streams of research have found that in high-income countries, the male partner tends to be on average two to four years older than the female partner, irrespective of the specific behavior studied. A similar pattern has been found for parental age differences (Dudel and Klüsener 2021). However, parental age differences can be considerably larger in low-income countries, reaching an average difference of up to 18 years (Schoumaker 2019).

Findings regarding trends over time in age differences have been more mixed. Research on long-term trends in marital age difference suggests that it is a long-standing pattern with differences even being higher in the early 20th century (Van de Putte et al. 2009; Esteve, Cortina, and Cabré. 2009). While the average parental age difference has stayed constant in recent history in some countries, such as Sweden (Kolk 2015), it has

been increasing since the late 1990s in several Eastern European countries (Dudel and Klüsener 2021).

Men-older unions as the norm? Explanations for parental age differences

Two main explanations have been put forward to explain why men are on average older than women: the first refers to evolution (e.g., Kenrick and Keefe 1992; Buss 1989), while the second refers to social status (Presser 1975).

According to the evolutionary perspective, heavy parental investment in offspring has made both women and men selective in their partner choices (Trivers 1972; Kenrick and Keefe 1992). However, while the investments of women are high in terms of bodily resources (pregnancy and lactation), the investments of men are more indirect (providing resources such as food or security). Based on this perspective of differential investments, it has been argued that when choosing a partner, women are more focused on whether the man is able to provide indirect resources, while men are more focused on whether the woman is healthy and has reproductive potential (Kenrick and Keefe 1992). Among men, the ability to provide resources generally increases with age, which tends to put older men at an advantage. Among women, on the other hand, biological fitness tends to decrease with age, which puts younger women at an advantage. This makes age a directly observable proxy of “fitness,” which has been brought forward as an argument for evolved age preferences (Conroy-Beam and Buss 2019).

From the social status perspective, women have historically had fewer opportunities than men to obtain resources and social status, be it through education or work (Presser 1975). Thus, it was common for a woman to secure or to raise her social status through partnering with a man (Blake 1974, cited by Presser 1975). As older men tend to be more established in life, a union in which the man is older is likely reducing the couple’s uncertainty about their future social status trajectory (Presser 1975). This aspect has probably contributed to the lower prevalence of men-younger unions (Bozon 1991). Moreover, especially in societies with a strong patriarchal orientation, social norms regarding male and female reproductive behavior have been instrumented to stabilize existing sex- and age-related social inequalities (see, e.g., Szoltysek et al. 2017), and to reinforce men-older unions.

In addition to these theoretical perspectives, there are also structural limitations to parental age differences, as gender differences in the upper limit of the reproductive age range constrain age differences. In demographic research, the reproductive age range of women is often defined as starting from age 15 and ending at age 49, with some variation in the limits. At ages above the upper limit, a large majority of women are sterile, while

at ages around the lower limit many women are not fecund yet and age norms discourage childbearing. For men, the lower limit of the reproductive age range is usually set to a similar value. The upper limit is, however, usually set to a higher value. This is because the fecundity of men also declines with increasing age as it does for women, but there is considerable heterogeneity, and some men remain fecund into high ages (Sartorius and Nieschlag 2010). Taken together this means that for older fathers above age 49 the mother will almost always be younger. More generally, the higher the age of the father the higher the expected parental age difference, as with increasing age less and less fecund women are available.

Heterogeneity in age differences by women's and men's ages at childbirth

While the above-discussed mechanisms can foster men-older partnerships, such partnerships might occur more frequently and with larger age differences among younger mothers for several reasons, implying heterogeneity in parental age differences conditional on the age of the mother. First, on average, young men have not advanced their status as much as older men, while young women often have low resources themselves (Sigle and Kravdal 2021). This might partly explain why age norms on the lowest appropriate childbearing ages tend to be a few years higher for men than for women (Paksi and Szalma 2009), which decreases the likelihood of young mothers to have children with similar-aged or even younger men. Second, if an older woman partners with a much older man, the likelihood of the couple being able to have children might be low, as both male and female fecundity decrease with age (Kühnert and Nieschlag 2004) and because of age norms that socially discriminate against late parenthood (Billari et al 2011). Third, older fatherhood increases the risk that the father will die before his children reach adulthood, which can have several negative consequences (see, e.g., Myrskylä et al. 2014). Thus, a woman of higher reproductive age might be more reluctant to partner with a much older man.

Turning to the perspective of the father, the arguments provided in the previous paragraph suggest that parental age differences are increasing with the age of the father, mainly due to the higher social status of older men and the higher fecundity of younger women. Moreover, for a young man being much older than the mother is not possible due to biological limitations (i.e., age at menarche for women) and the lack of social acceptance of such behavior (Paksi and Szalma 2009). The latter is also expressed in age-of-consent laws. These considerations are also in line with evidence from research on marriage showing that the age difference between the spouses tends to increase with the husband's age (e.g., Gustafson and Fransson 2015).

Potential drivers of changing parental age differences: Female empowerment, fertility postponement, economic uncertainty, and immigration

Changes in parental age differences may be driven by several factors. Female empowerment and fertility postponement are likely key drivers of these shifts. In recent decades, the position of women within society has substantially changed. In most high-income countries, women are, on average, more economically independent and have more rights today than 50 years ago. The highly interrelated factors that contributed to this female empowerment are discussed as key elements of the gender revolution (Goldscheider, Bernhardt, and Lappegård 2015) and the Second Demographic Transition frameworks (Lesthaeghe 2014). These factors include new labor market opportunities for women due to the rise of the service sector and the increasing enrolment of women in higher education, which today surpasses that of men in many countries (Grow, Schnor, and Van Bavel 2017). The extension of the welfare state, which has generally moved away from an orientation on the male breadwinner model and toward individualistic support schemes, also made mothers more independent of their male partners (Esping-Andersen 1999; McLaughlin and Glendinning 1994).

Female empowerment has had a strong impact on the timing of fertility decisions and on incentives to enter age-heterogamous or age-homogamous unions, particularly for older mothers. Educational attainment of women has been rising across high-income countries, including in the countries we study in this paper (see Figure A5 in the Supporting Information). Rising female educational attainment encourages the postponement of births to higher reproductive ages, as many women wait to have children until they have finished their education (Neels and De Wachter 2010). This postponement process is, however, selective by social status, as women with higher socioeconomic status are particularly likely to postpone childbearing (Ní Bhrolcháin and Beaujouan 2012; Lima et al. 2018). As a result, late fertility has increasingly become the domain of highly educated women who also tend to have higher levels of economic independence. For these women, the desire to have an older male partner for reasons of economic security is likely to be less relevant than other considerations when searching for a partner, including the consideration that age homogamy decreases the likelihood of unequal power relations in the partnership (Dribe and Stanfors 2017). Indeed, among married couples, a small age difference between the spouses is often associated with high educational attainment and high income (Gustafson and Fransson 2015). It has also been shown that unions in which the partners have similar characteristics tend to be of higher quality (Gaunt, 2006). Being of similar age increases the chances that the partners will share characteristics. All of these considerations provide support for the view that women who postpone union formation and parenthood are also

more likely to form more age-homogenous partnerships (Cheng and Kolk 2021; Esteve, Cortina, and Cabré 2009; Kolk 2015; Van Poppel et al. 2001).

In addition to these developments among older mothers, there have also been substantial changes in fertility patterns at younger ages. However, these changes have tended to increase age differences, potentially leading to a polarization in parental age differences between younger and older mothers. The socially selective postponement process discussed above has led to fertility at younger ages becoming largely the domain of mothers with lower social status (Sigle and Kravdal 2021). In addition, economic uncertainty has increased in recent decades (Vignoli et al. 2020), which is particularly relevant for younger individuals. This is because younger people are less integrated into the labor market and often work with low levels of labor protection. These developments make (potential) young mothers particularly vulnerable to labor market shocks. Thus, economic recessions affect fertility at younger ages in particular (Goldstein et al. 2013). There is evidence that for young adults, levels of economic security were higher in the “golden age of marriage” of the mid-20th century, as at that time, even young (male) adults could secure relatively high salaries (see, e.g., Ruggles 2015 for the United States). Thus, fertility at younger ages has been increasingly associated with economic insecurity and low socioeconomic status (Sigle and Kravdal 2021). One strategy for young women to alleviate this uncertainty is to invest in education, which frequently results in postponement (Kreyenfeld 2005). Another strategy young women can use to reduce uncertainty is to pair with an older male partner who is already more established in the labor market. However, employing this strategy might come at the price of less gender equality within the couple. These considerations are also supported by evidence on marital age differences, indicating that educational selection into men-older relationships is strong (Gustafson and Fransson 2015).

Another factor that affects age differentials at younger maternal ages is shifts in immigration. The proportion of migrants among young women has been rising in many high-income countries. For instance, between 1990 and 2015, the proportion of migrants in the population of women between the aged 20 and 24 has increased from 10.5 percent to 13.7 percent in Sweden and from 10.4 to 12.7 percent in the United States (UN Population Division 2020). Substantial shares of these immigrants come from low- or middle-income countries where the average maternal age at childbirth tends to be lower, while the average age difference between the mother and the father is rather larger than in high-income countries (Ugglå and Wilson 2020; Schoumaker 2019). In combination with the socially selective postponement of fertility, the contribution of migrants to fertility at younger maternal ages has increased (see, e.g., Burkimsher 2017), which may, in turn, have contributed to a polarization in parental age differences between younger and older mothers.

How parental age differences from the perspective of fathers have been affected by female empowerment, postponement, economic uncertainty, and migration is less clear. As the enrolment of men in higher education has increased, it is not surprising that postponement has also occurred among men (Dudel and Klüsener 2021; Beaujouan 2020). Highly educated men tend to support gender equality more than less educated men (e.g., Cha and Thébaud 2009). This implies that women at higher reproductive ages now have access to a bigger pool of similarly aged partners who are also interested in having power-equal relationships. Moreover, in the context of rising living costs and growing economic uncertainty, a dual-earner family with an economically independent female partner may be more resilient to economic shocks (such as one partner losing a job or getting ill). This trend might further increase the prevalence of couples who are more gender equal and have a smaller age gap. However, other trends might increase the likelihood of men partnering with younger women. As we discussed above, growing economic uncertainty is likely to increase the incentives for younger women of lower social status to partner with an older man. Considering that men are themselves more likely to partner with a woman of lower socioeconomic status (e.g., Domański and Przybysz 2007), this could lead to an increase in the number of couples with a larger age gap. Finally, immigration could also result in an increase in the average age gap between partners if the average age difference among immigrant couples is larger than that among the rest of the population. Overall, among men, these mechanisms seem to counteract each other in part. Thus, for men, the directions and the age patterns in these trends seem to be more dependent on the degree to which each of these mechanisms plays out in a specific country.

Consequences of (changing) parental age differences

Shifting patterns of age differences within couples have implications at both the individual and the societal level. As we noted earlier, the age difference between spouses is an indicator of the distribution of bargaining power within the couple (e.g., Carmichael 2011). The more powerful partner generally has a greater say over decisions and might make choices that benefit him or her more (e.g., Friedberg and Webb 2006). For instance, each partner's bargaining power influences the division of labor in the couple, and, in turn, each partner's individual income (e.g., Carollo et al. 2019; Dribe and Nystedt 2017). Hence, if younger women are increasingly likely to have children with a much older father while older women are increasingly likely to have children with a similar-aged man, the mother's age at childbirth might gain significance as an indicator of gender equality within families.

However, the individual-level implications might go beyond power constellations, as age-selective changes in the average age gap between

parents might also have implications for old age. Research has shown that a large age difference between partners increases the probability that the younger partner will outlive the older partner by several years (Drefahl 2010) and that a much younger partner often provides care for the older partner in case of disability, averting the need for nursing home care (Lakdawalla and Schoeni 2003). Thus, if young women are increasingly likely to pair with much older men, these women can, on average, expect to spend a longer period of time caring for their ailing partner and/or in widowhood as they age. In contrast, if more older mothers are having children with similar-aged men, they can, on average, expect to spend a shorter period of time caring for their ailing partner and/or in widowhood.

At the societal level, socially selective age disparities in parental age differences and their development over time can also have self-reinforcing effects. It has been argued that the gender revolution involves shifts in norms regarding how the roles of men and women are perceived (Esping-Andersen and Billari 2015). Shifts in norms require diffusion processes in which social adaptation and social learning can play a role (Kohler 2001; Klüsener, Dribe, and Scalone 2019). These processes are frequently initiated and driven by vanguard groups and are then spread to wider parts of the population (see also Esping-Andersen and Billari 2015). For example, declining age differences in couples may be initially limited to a few gender-equal couples and then become more common. Research on the diffusion of social norms and behavior at the individual level has emphasized that the adoption of new norms is positively related to similarities between individuals (Bongaarts and Watkins 1996). Being members of the same cohort could be such a similarity, as it implies that people grew up during a similar time period and are similar in age throughout their life course (see also Lutz 2013).

However, within-cohort diffusion of gender equality norms is likely impeded by social polarization due to socially selective fertility postponement. It has been pointed out that younger and older mothers increasingly differ in terms of important social characteristics, with mothers with a migrant background (Burkimsher 2017) and low education being more likely to have children at younger ages (Ní Bhrolcháin and Beaujouan 2012; Lima et al. 2018). The polarization in fertility timing implies that among mothers of the same birth cohort, the likelihood of these two groups interacting in, for example, private life and educational institutions is reduced by the fact that their children are born and are growing up at different times. This likely impedes the diffusion of gender equality norms from vanguard groups to other parts of society, especially given that the vanguard groups of a cohort tend to have their children later than the nonvanguard groups. These polarized patterns can be further stabilized through the intergenerational transmission of values and fertility from parents to children (e.g., Steenhof and Liefbroer 2008; Carlson and Knoester 2011). Thus,

while the socially selective postponement process is an important aspect and driver of the gender revolution in the vanguard groups, the outcome of this process might make it more difficult for gender equality norms to diffuse from these vanguard groups to other parts of the society.

Data

Our analyses are based on unique vital registration data covering 316,756,697 live births in 15 high-income countries. The countries (in alphabetical order) and the years we cover, as well as the total number of births per country, are provided in Table A1 in the Supporting Information.

In total, there are 686 country-year combinations. The data for all years and countries are taken from birth registers and are complete enumerations, except for the first years of the U.S. data. Specifically, we use sampling weights to take into account that the U.S. data before 1972 are based on 50 percent samples taken from the birth registers of U.S. states. From 1972 onward, the data include complete birth registers from an increasing number of states; and from 1985 onward, the full birth register data for all states are available.

Most registers cover all births of the resident population, except the registers for England and Wales, which include all births occurring in the corresponding territory. For some births, the father or the mother might be residing abroad: in the latter case, the birth is likely not covered by the register; in the former case, the data we have access to usually do not indicate that the information for the father relates to a person abroad. However, we expect that very few births are affected by this problem. A detailed description of how additional country-specific data issues were dealt with is available in the Supporting Information.

In most country data sets, the age of the father is missing for some births, while the age of the mother is usually known. To impute missing paternal ages, we used the so-called conditional approach (Dudel and Klüsener 2019). This approach is described in detail in the Supporting Information.

Measures and methods

We provide four sets of results. First, to give a general impression of fertility postponement among men and women across our set of countries, we analyze trends in the mean paternal and maternal age at childbirth. In the Supporting Information, we complement this analysis with an investigation of trends in the average parental age difference, which we derive by subtracting the maternal mean age at childbirth from the paternal mean age at childbirth. A positive value indicates that fathers are older on average, while a negative value indicates that mothers are older on average.

Second, to provide insights into how heterogeneity of specific age constellations at the couple level has evolved, we apply measures of hypergamy and hypogamy. This approach allows us to look at trends that are likely relevant as signifiers of certain power constellations. Specifically, we show trends in the proportion of births to hypergamous couples in which the father is more than five years older than the mother; that is, births for which the age difference can be considered large. We also provide trends in the proportion of births to hypogamous couples in which the mother is older than the father. These findings indicate how heterogeneity in age differences has developed. Changes in the age thresholds—for example, the father being at least seven years older than the mother—lead to qualitatively similar results. We decided to use the five-year threshold as evidence suggests that an age difference of more than five years tends to be less socially accepted (Banks and Arnold 2001).

Third, in order to take a closer look at the polarizing pattern between younger and older women of reproductive age, we calculate the proportions of births to hypergamous and hypogamous couples separately for younger mothers (below age 25), for older mothers (above age 35), and for mothers aged 25–34.

Fourth, to shed further light on heterogeneity at the level of single maternal and paternal ages at childbirth, we estimate linear regression models that allow us to summarize changes in age differences across the whole age range in two simple parameters: the mean parental age difference for young mothers/fathers, and heterogeneity across the maternal or the paternal age range. We have chosen a linear specification, as it provides a good approximation of the relationship between mean age differences and maternal or paternal age. As the dependent variable, we take the conditional average age difference of a given year and country and use the corresponding maternal age minus the lower age limit as the explanatory variable (see below for details). Formally, if X denotes the age of the mother, Y denotes the age of the father, and XL denotes the lower age limit of maternal ages at childbirth, then analyses conditioning on the age of the mother use the values of $M(Y - X|X)$ as a dependent variable, where M denotes the arithmetic mean, and $X-XL$ is used as an explanatory variable: $M(Y - X|X) = \alpha_x + \beta_x(X-XL) + \varepsilon$, where ε is an error term. We run these regressions for each country-year combination, such that for each country and year, we have an intercept α_x and a slope β_x .

When running regressions conditioned on the age of the mother, we restrict X to be in the range of 20–40 (i.e., $XL = 20$). This is because, at lower and higher ages, the number of births is low in many countries and years. This restriction, in combination with using $X-XL$ as an explanatory variable, allows for a simple interpretation of the intercept α_x : namely, that it captures the average age difference between the mother and the father when the mother is 20 years old, that is, when the mother is young. The

slope β_x captures heterogeneity across the age range. The larger the absolute value of β_x is, the larger the difference between younger and older mothers is. If β_x is negative, the age differences are decreasing with the age of the mother, and older mothers are exhibiting smaller age differences; while the opposite is the case if β_x is positive. Compared to the other types of analyses we provide, the conditionality built into the regression approach avoids that results are driven by changes in the marginal age distributions of mothers and fathers. As postponement changes the contribution of specific ages to the total distribution over time, we also run robustness checks in which we stratify analyses by maternal ages using deciles. These analyses produce very similar patterns and are available in the Supporting Information (Figure A6).

We also run regressions conditioning on the age of the father, which work in a similar way. When conditioning on the age of the father, we use Y as an explanatory variable; that is, $M(Y - X | Y) = \alpha_Y + \beta_Y(Y - YL) + \varepsilon$, where YL denotes the lower age limit of paternal ages at childbirth. For the fathers, we chose an age range of 20–45. The age range is wider for men than for women because men tend to have children at somewhat higher ages than women.

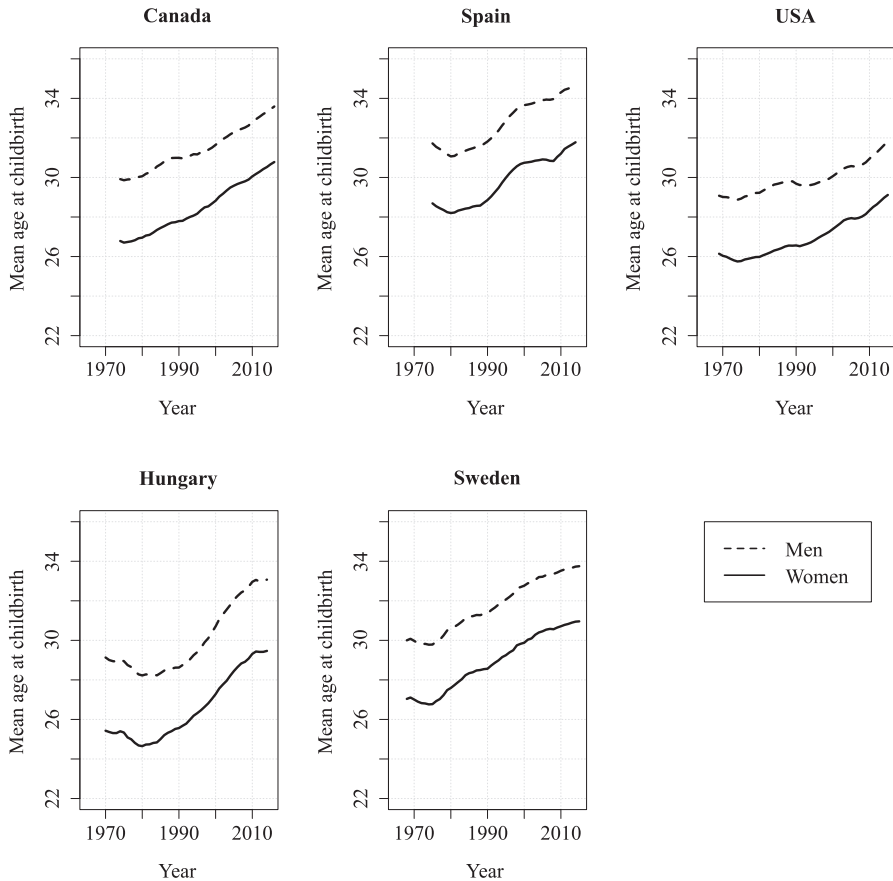
Finally, we also conduct all analyses by parity of the mother to show how changing parental age differences could vary across different parity statuses.

Results

Similar trends in mean ages at birth for men and women

Before we turn to the parental age differences by maternal or paternal age, we first present general trends in paternal and maternal mean ages at childbirth. Figure 1 shows trends in fertility postponement among men and women in a selection of the countries we cover: Canada, Hungary, Spain, Sweden, and the United States. These countries have been selected because they have data going back to 1975 or even earlier, which allows us to analyze long-term trends. Results for all countries are available in the Supporting Information (Figures A1 and A2) and are mostly in line with the findings shown in Figure 1. While the mean ages at childbirth differ considerably across countries and over time, the trends have been rather consistent for both men and women, at least since the 1990s. Specifically, we show that in all 15 countries, the mean age at childbirth increases, and there are strong postponement trends among both men and women. The trends for men generally run parallel to the trends for women, with men delaying childbearing to roughly the same extent as women. For instance, in Sweden, the mean age at childbirth for women increases 3.9 years between 1968 and 2015, from 27.0 years to 30.9 years; while for

FIGURE 1 Trends in the mean age at childbirth for men (dashed line) and women (solid line) in selected countries



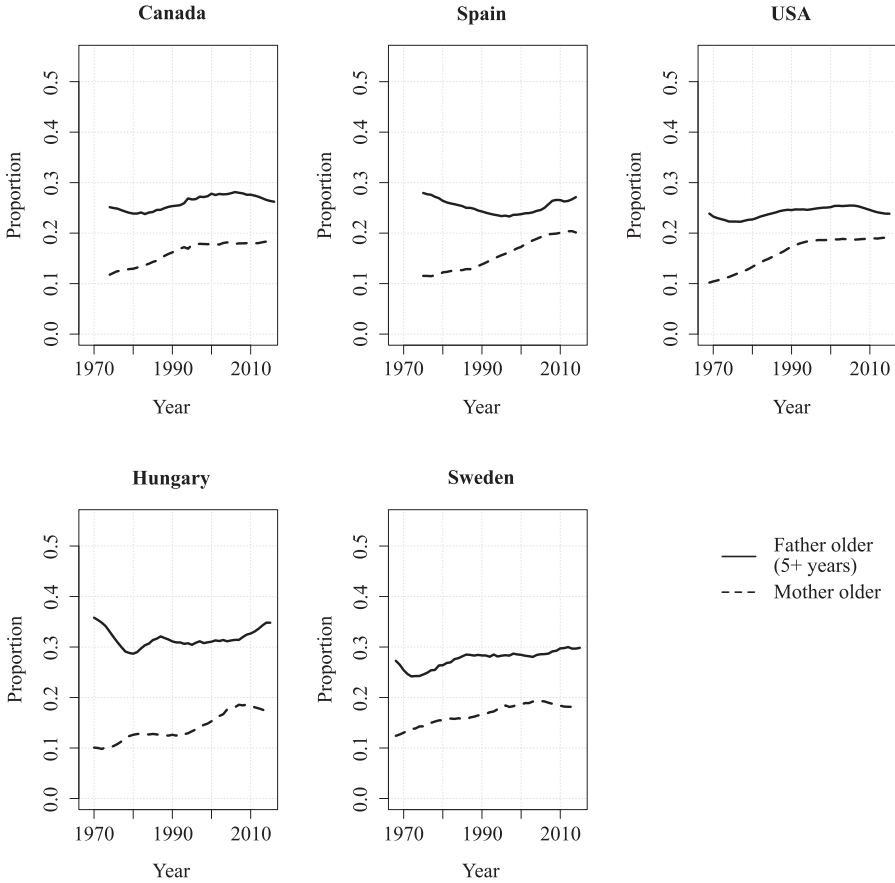
SOURCE: Official Statistical Data, NBER (USA), own calculations.

Swedish men, the mean age at childbirth increases 3.7 years over the same period, from 30.0 years in 1968 to 33.7 years in 2015. Generally, the correlation between the mean age at childbirth for women and the mean age at childbirth for men is close to one. This is also visible in figures displaying trends in the mean parental age difference, which are shown and discussed in the Supporting Information (Figures A1 and A2).

Hypergamy and hypogamy: Evidence for polarization by maternal age

Figure 2 shows the proportion of births in which the father is at least five years older than the mother (a subset of births to hypergamous couples with relatively high age differences; solid line), and the proportion of births in which the mother is older than the father (births to hypogamous couples; dashed line).

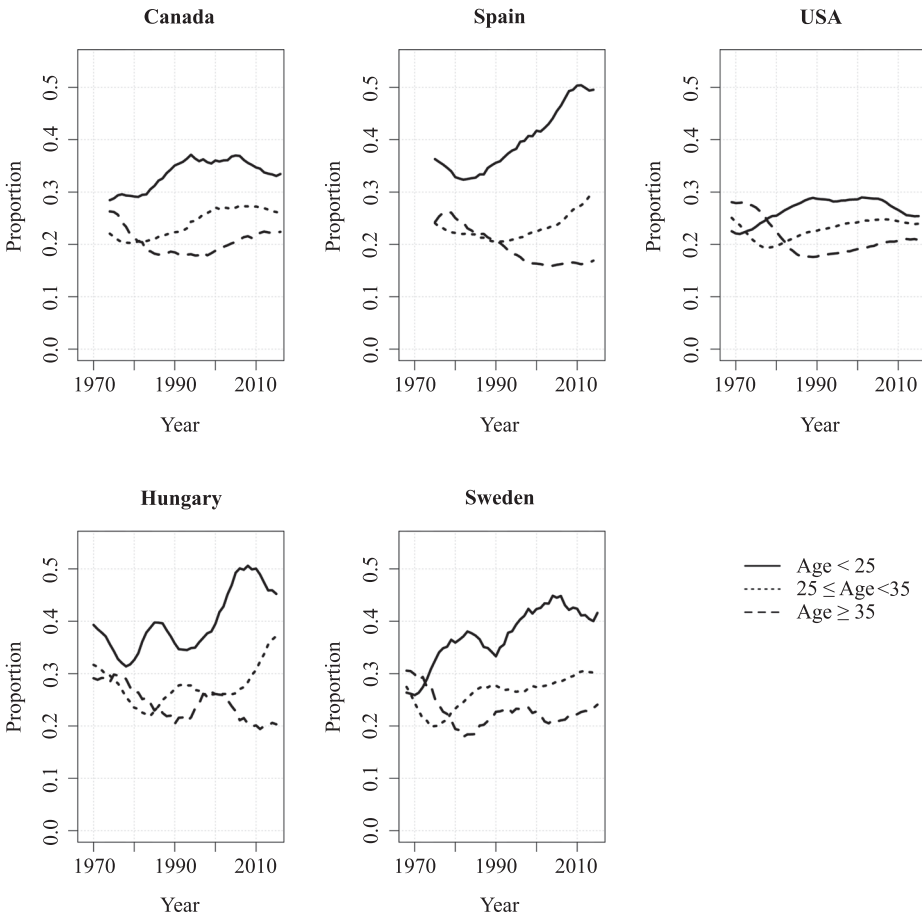
FIGURE 2 Proportion of births to hypergamous couples in which the father is at least five years older than the mother (solid line), and proportion of births to hypogamous couples in which the mother is older than the father (dashed line) in selected countries



SOURCE: Official Statistical Data, NBER (USA), own calculations.

For all five countries, the proportion of births in which the mother is older increases substantially, from a value of around 10 percent at the beginning of the time series to a value of around 20 percent at the end of the time series. The increases become less steep in the last decade, with Sweden and Hungary even reporting a decrease at the end of the observation period. Notably, the proportion of births in which the father is much older than the mother does not mirror the trend for births to hypogamous couples. The last value of the time series is around the same level or higher than the first value, and the proportion of births to hypergamous couples has even increased slightly in recent years in Hungary, Spain, and Sweden. Overall, these findings roughly mirror previously published results for age

FIGURE 3 Proportion of births in which the father is more than five years older to mothers under age 25 (solid line), to mothers aged 25–34 (dotted line), and to mothers aged 35 or older (dashed line) in selected countries

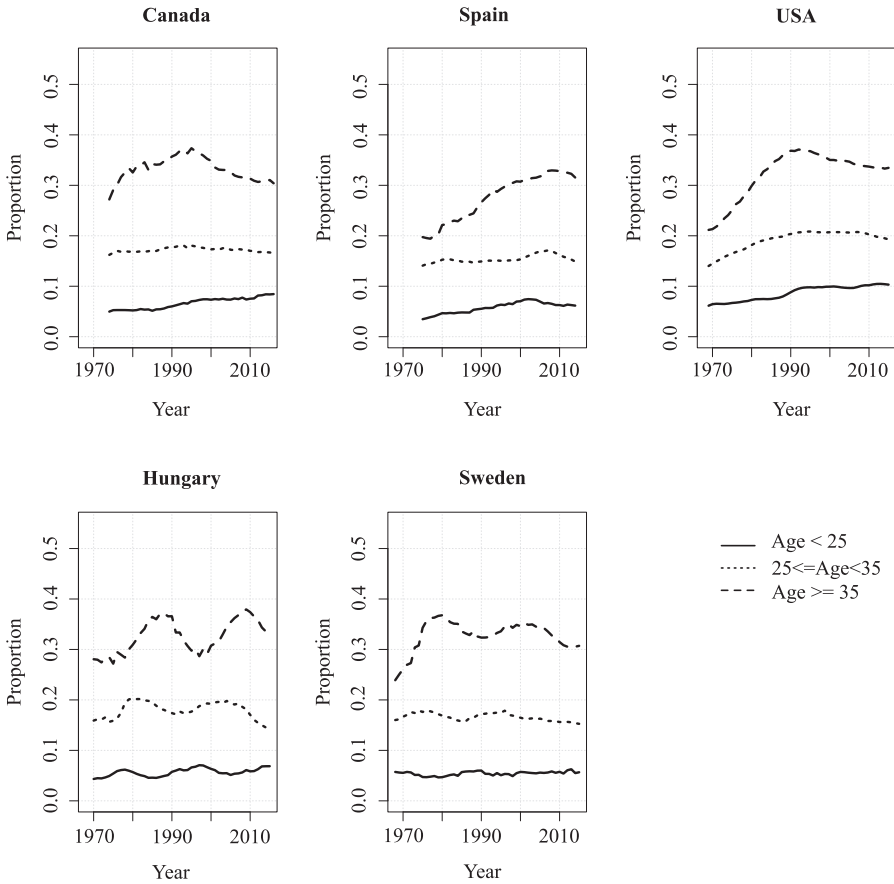


SOURCE: Official Statistical Data, NBER (USA), own calculations.

differences at marriage, which show an increasing polarization of age differences (e.g., McKenzie 2021).

As a next step, we explore the polarized age pattern among mothers in more detail by looking at groups who differ by maternal age at childbirth. Figure 3 shows the proportion of births in which the father is at least five years older than the mother, separately for younger mothers (below age 25; solid line), older mothers (aged 35 or older; dashed line), and mothers aged 25–34 (dotted line). Figure 4 presents the proportion of births in which the mother is older than the father. Figure 3 indicates that among younger mothers, there are substantial increases in births to hypergamous couples with large age differences. These increases are particularly strong in Hungary, Sweden, and Spain, with the former two countries exhibiting a

FIGURE 4 Proportion of births in which the mother is older than the father to mothers under age 25 (solid line), to mothers aged 25–34 (dotted line), and to mothers aged 35 or older (dashed line) in selected countries



SOURCE: Official Statistical Data, NBER (USA), own calculations.

rollercoaster-like pattern. Among older mothers, the proportions of births to hypergamous couples are still comparatively high in the 1970s in many countries. This pattern changes quickly, as parallel to the large increase in the proportions of births to hypergamous couples among younger mothers, there are substantial decreases among older mothers, with the decreases being particularly concentrated in the 1970s and 1980s. Starting in 1990, the proportions plateau or even slightly increase. The results for mothers aged 25—34 fall between those for younger and older mothers. Overall, our figures demonstrate that while the maternal age at childbirth is still a very weak predictor of the probability of a birth to a hypergamous couple in the early 1970s, this changes drastically over the following 50 years. This is particularly the case for the European countries, whereas the polarization trends by maternal age are less strong in North America.

The proportion of births to hypogamous couples depicted in Figure 4 increases among older mothers, albeit not in a linear fashion. The increases are particularly visible before 1990. After 1990, the trend pattern across countries is more heterogeneous. However, at the end of the observation period, all countries have levels that are higher than the initial levels. Among younger mothers, the proportion of births to hypogamous couples has increased only slightly. Results for mothers aged 25–34 again fall between those for younger and older mothers. In contrast to patterns observed for the births to hypergamous couples, our figures suggest that the maternal age at childbirth is already a good predictor of births to hypogamous couples in the 1970s and that it becomes an even better predictor over the subsequent decades. Overall, Figures 3 and 4 provide evidence of substantial polarization trends by maternal age that are particularly pronounced for births to hypergamous couples.

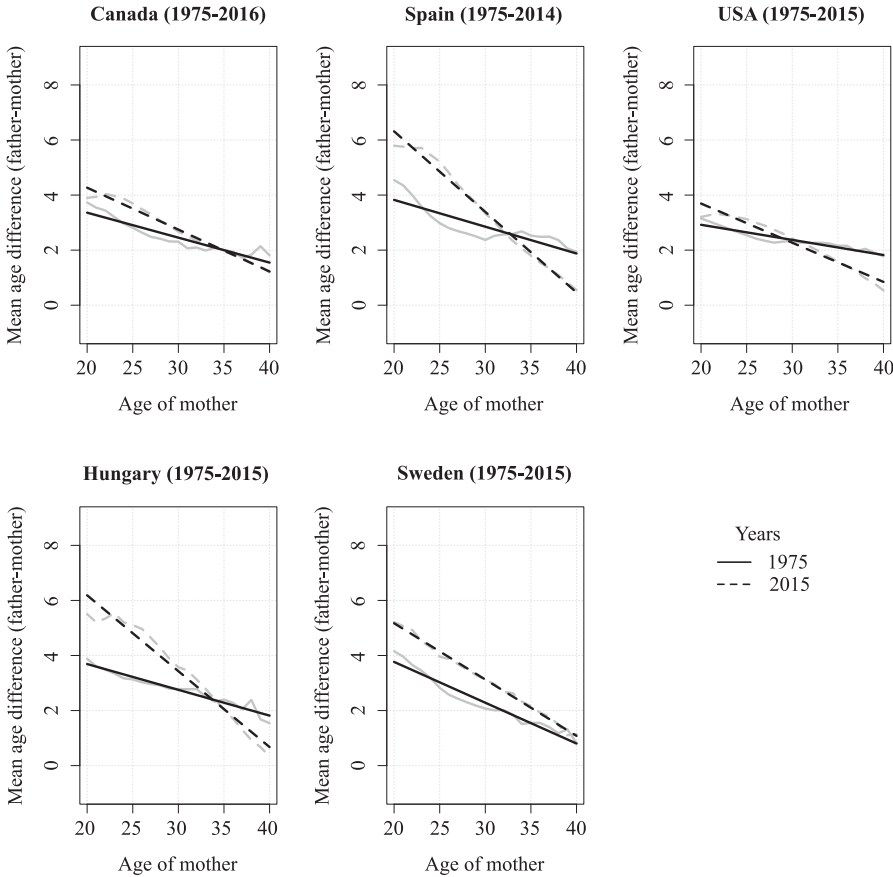
Conditional age differences are gendered

We now move from measures of heterogamy and homogamy to investigating mean parental age differences by single maternal and paternal ages at birth. Figure 5 presents the mean parental age differences and the results of our regression approach conditional on maternal age at childbirth, while Figure 6 shows comparable findings conditional on paternal age at childbirth. We again focus on the five countries for which long-time series are available.

In these figures, the gray lines depict the patterns observed in the data, while the black lines show the estimated linear relationship, as described in the methodological section. The solid lines provide the results for 1975, and the dashed lines display the results for the mid-2010s. As the regression estimates closely follow the data, we will focus on them for our interpretation. For instance, the upper-right panel of Figure 5 shows that in the United States in 1975 the average parental age difference is around three years for mothers aged 20, while it is about two years for mothers aged 40. In 2015, the respective values are close to four years (mothers aged 20) and one year (mothers aged 40).

When we compare the countries shown in Figure 5, we see some heterogeneity but also some consistent patterns. In 1975, the regression lines are rather similar for all countries. This is remarkable considering that the economic and political situations in these countries were very different at that time. The relationship is negative, which indicates that the mean parental age differences are smaller among older mothers. The slopes vary between -0.06 years and -0.17 years. The results in the mid-2010s, on the other hand, are more diverse. However, in all of the countries, the intercept of the regression lines is higher in the mid-2010s than in 1975, and the slopes are steeper. Thus, across these countries, the average age difference

FIGURE 5 Mean parental age differences at childbirth by maternal age, mid-1970s versus mid-2010s (in years) for selected countries. Solid lines for 1975 and dashed lines for around 2015. Gray lines are observed values and black lines are fitted regression lines

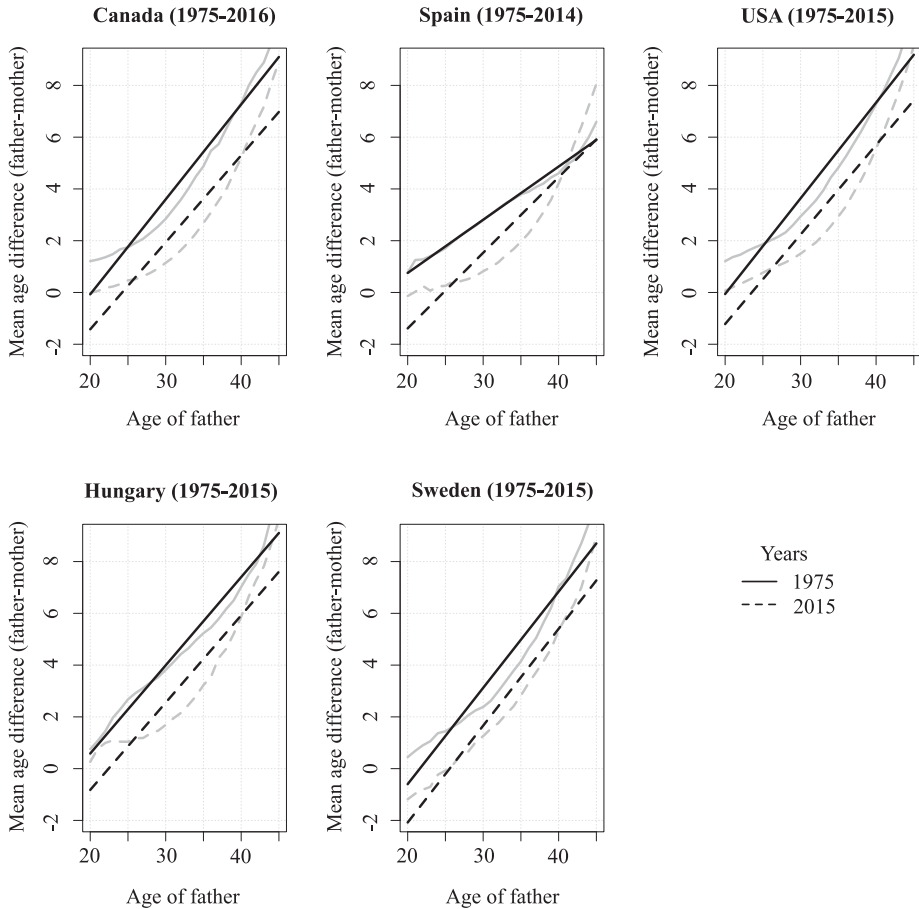


SOURCE: Official Statistical Data, NBER (USA), own calculations.

is increasing for younger mothers and is decreasing for older mothers. This, in turn, implies that the heterogeneity across the age range of mothers is also increasing. The shifts are particularly large in Spain and Hungary, while they are smaller in the United States and Canada. This polarization by age is not just driven by extreme ages at childbirth but is visible throughout the whole reproductive age range. The pattern for Sweden deviates from that for the other countries in that among older mothers, the mean age difference between the mother and the father is higher in 2015 compared to 1975 (albeit to a lesser extent than among younger mothers).

Figure 6 shows patterns conditional on paternal age. As before, the age difference is calculated by subtracting the age of the mother from the age of the father. This implies that in order to obtain the mean age of the mother,

FIGURE 6 Mean parental age differences at childbirth by paternal age, mid-1970s versus mid-2010s (in years) for selected countries. Solid lines for 1975 and dashed lines for around 2015. Gray lines are observed values and black lines are fitted regression lines

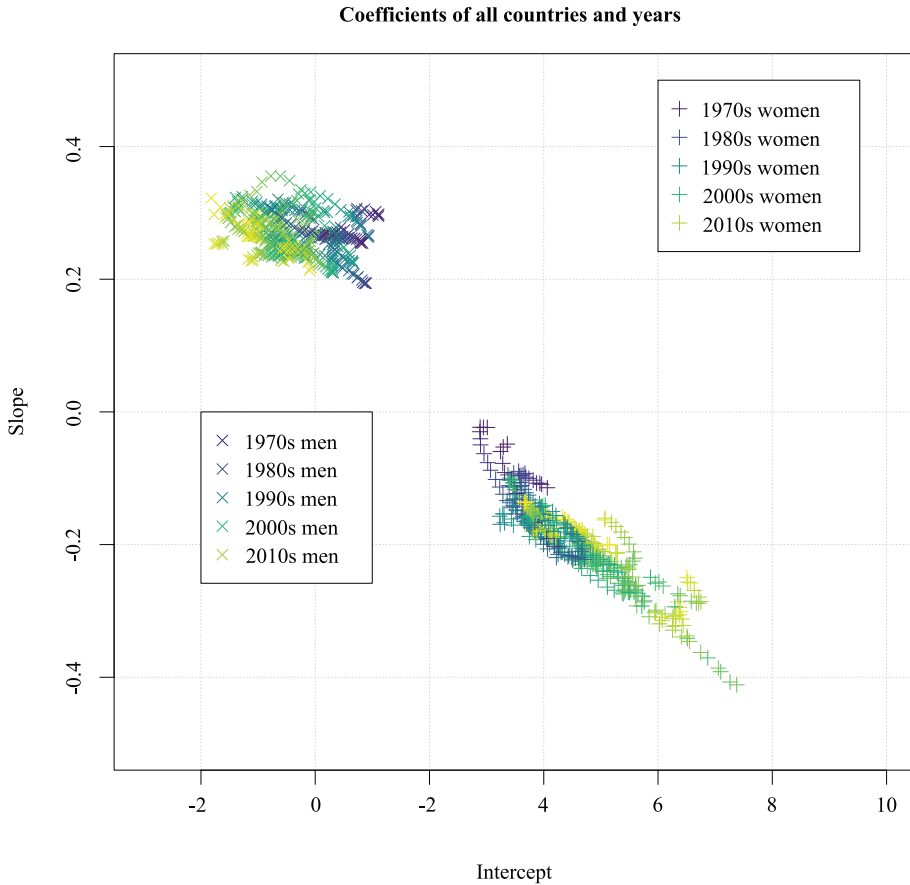


SOURCE: Official Statistical Data, NBER (USA), own calculations.

it is necessary to subtract the age difference from the paternal age. The estimated slopes are positive, which shows that among fathers the parental age differences are increasing with age; that is, that older fathers tend to have children with comparatively young mothers. The intercept is around or even below zero, which indicates that the age differences are small for young fathers.

The trends we observe for men are quite consistent over time. In 1975, all of the countries apart from Spain display very similar slopes. Over time, the initially less steep slope for Spain becomes more similar to the slopes for the other countries, while the slopes of the other countries basically remain unchanged. All of the countries show a decrease in the intercept,

FIGURE 7 Regression coefficients for women and men—all 15 countries



SOURCE: Official Statistical Data, NBER (USA), own calculations.

which indicates that generally the age differences are decreasing across all paternal ages.

Conditional age differences: Regularity across time and space

In Figure 7, we provide a summary graph of all intercepts and slopes for both mothers and fathers and for all countries and years, covering 686 country-year combinations. Earlier years are shown in purple (1970s and earlier), and recent years are shown in green (2010s). The color gradient for the years between these two periods illustrates how the trends evolve over time.

Figure 7 demonstrates that the findings for the five countries described above are part of a larger, more general, and remarkably consistent pattern. For women, nearly all of the slope-intercept combinations fall along a single line, with the intercepts increasing and the negative slopes decreasing and

becoming steeper over time. Thus, the parental age differences increase for younger mothers and decrease for older mothers; and heterogeneity across the age range increases. The slopes for men show less variation than the slopes for women. Over time, these positive slopes either stay constant or become steeper. Meanwhile, the intercepts for men generally decrease over time. Thus, among fathers, parental age differences are generally declining, but there is also a rather stable pattern of older fathers tending to have children with much younger mothers, as the slopes are positive. We also repeated this analysis by parity of the mother. The results are shown in the Supporting Information and are very similar to the findings presented here (Figure A3). Thus, the patterns we observe do not appear to be driven by specific parities.

Discussion

Main findings

Our study fills an important gap in research on female empowerment and fertility postponement by providing for the first time a comparative analysis of longer term trends in parental age differences at childbirth. These parental age differences are highly relevant for power relations within couples as the transition to having a(nother) child often results in a renegotiation of the gendered division of labor. In addition to using descriptive measures of hypergamy and homogamy, we applied a novel regression approach that allowed us to summarize conditional age differences in two parameters: the mean parental age difference for young mothers/fathers, and heterogeneity across the maternal or the paternal age range. Results from both approaches indicate that parental age differences among younger and older mothers have become increasingly polarized. While the likelihood of being partnered with a much older man has increased among younger mothers, it has decreased among older mothers. We also showed that the shift in parental age differences over time has been gendered and that from the perspective of fathers age differences have decreased. This decrease varies little by paternal age. Moreover, consistent with the previous literature, we found that in all of the studied countries, fathers are on average older than mothers and that both among men and women the mean age at childbirth is increasing due to postponement.

The polarization in parental age differences between younger and older mothers is likely driven by a number of interrelated processes. A key process is postponement of fertility, and in particular postponement of fertility that is selective by socioeconomic status and migration background (see Lima et al. 2018; Burkimsher 2017). Moreover, growing economic uncertainty (Vignoli et al. 2020) and immigration (Uggla and Wilson 2021) are also relevant, as was discussed in the background section. We also observed

that the total and the relative number of births to younger mothers have declined in all of the countries we studied (see Figure A4 in the Supporting Information), and younger mothers have become a more selected group. However, this should not be understood as a mechanistic process whereby births to parents with large age differences are less likely to be postponed than births to parents with small age differences. Instead, it appears that the postponement itself opens up new opportunities for women to achieve higher levels of economic independence (Mills et al. 2011), which may, in turn, mean that women have fewer economic motives to partner with an older man.

For women, female empowerment, fertility postponement, increasing economic insecurity, and immigration all seem to foster a polarization in parental age differences between younger and older mothers. By contrast, the picture is much less clear among men, as we showed in our theoretical considerations. This may help to explain why we did not find a polarization of patterns among men. Among them the decline in parental age differences is very similar across the whole studied paternal age range. Our observation that the shifts in the patterns for men are less drastic than the shifts for women fits with other findings on fertility trends; for example, that the fertility changes by social status or by age that have occurred in recent decades have been less pronounced for men than for women (see Jalovaara et al. 2018). Moreover, relatively large parental age differences for older fathers at the upper end of the age range might at least be partly due to two factors: maternal age constraints in childbearing and increased rates of divorce and repartnering. The age range of maternal fertility is much more biologically constrained, while fathers are less limited by age. This means that older fathers are unlikely to have a child with a mother of a similar age. Increased rates of divorce and repartnering also contribute to parental age differences, as there is evidence that men tend to repartner with younger women (Bozon 1991).

The patterns we found are roughly consistent across the 15 high-income countries we studied. These results should be viewed in the broader context of the gender revolution and of the Second Demographic Transition frameworks. Although processes related to these frameworks started at different times and have progressed at different speeds in the countries we studied, all countries have experienced them to some extent. For instance, all countries have experienced fertility postponement. Nevertheless, there are also differences between the countries. For instance, the levels and trends in the (unconditional) parental age difference vary considerably between countries. While the average parental age difference has decreased in many Western countries, it has increased in recent years in the Eastern European countries we studied (also see Dudel and Klüsener 2021), which might point to retraditionalization tendencies in these countries (Fodor and Balogh 2010).

Increasing polarization between younger and older mothers with respect to parental age differences likely also indicates increasing polarization with respect to gender equality and (un)equal power relations within couples. From this perspective, mothers who have children at younger ages are likely to be in a union with unequal power relations in terms of income and the sharing of household labor, while mothers who give birth at older ages are likely to have greater power in the relationship. Beyond power constellations, the polarization likely has also implications for later life. As larger parental age gaps become increasingly concentrated among younger mothers, these mothers might be at higher risk of needing to care for an ailing partner for a longer period of time, and/or to experience widowhood (if the couple stays together). As our birth register data did not allow us to look into these longer-term implications at the individual level, we leave it to future research to investigate these issues using more detailed data.

In the background section, we also pointed out the societal-level implications of increased polarization. It is important to note that the polarization of fertility patterns occurs not only by age but also by characteristics such as educational attainment (Ní Bhrolcháin and Beaujouan 2012) and migration background (Burkimsher 2017). Thus, in recent decades, the age at which a woman has a(nother) child has increasingly become a marker of the social situation of the woman and the couple constellation the woman is in. Based on this perspective, we pointed out the mechanisms through which the socially selective postponement process might be both a driver and an inhibitor of the gender revolution. Our findings support the view that among vanguard groups of the gender revolution, the postponement was an important mechanism that allowed women to have more gender-equal relationships. At the same time, however, this polarization could decrease the likelihood of the within-cohort diffusion of gender equality norms related to family life from the vanguard to the nonvanguard groups, as these two groups are increasingly having their children at different ages. As our data did not allow us to look into the hypothesized mechanisms, we also have to leave it to future research to investigate whether the polarization in parental age differences is affecting the pace and the reach of the gender revolution.

Methodological considerations

Our study drew on high-quality birth register data with (mostly) complete enumeration. This implies that we could not cover voluntarily and involuntarily childless individuals and their partnering behavior, which might differ systematically from that of couples with children. In addition, the birth registers do not contain information on same-sex couples, even though these couples might be having children. Moreover, other information is limited or is not available; for example, parity, if available, is captured only for the mother, while no information on parity of the father could be obtained for

any of the countries in our sample. Finally, the practical relevance of the age difference between the partners for gender inequality at the couple level might be limited if the relationship between the mother and the father is only short-lived. While childbirths often occur in relatively stable long-term relationships (Balbo, Billari, and Mills 2013), this is not always the case. The interpretation of our results could be complicated if the magnitude of the parental age difference has an effect on the stability of relationships after childbirth.

As we mentioned above, our analysis did not provide insights into the microlevel mechanisms that may have led to the patterns we observed. These patterns could not be studied properly with the data we used here, as they contain only very limited information for each birth. However, the alternative data sets that would allow us to disentangle such mechanisms are likely to be national surveys or register studies, which are only available for a limited number of years and countries. In contrast, our analytical design has enabled us to make an important contribution to the debate by uncovering consistent patterns across a wide range of countries based on long-time series of individual-level birth register data.

Conclusion and outlook

This study showed that as childbearing is postponed to later ages both among men and women, parental age gaps exhibit considerable heterogeneity by age and gender, but with strong regularities across high-income countries. Our analysis also demonstrated that studying fertility postponement jointly for both sexes is a promising avenue for future research, particularly given that most existing studies have analyzed fertility postponement separately for men and women. The findings revealed that parental age pairing patterns are gendered. Future research should strive to further improve our understanding of the causes and consequences of the parental age gap polarization between younger and older mothers. The question of why parental age pairing trends among fathers show less heterogeneity by paternal age over time also warrants more research. Conducting research with longitudinal microlevel data is a promising avenue for gaining deeper insights into the causes and consequences of the observed patterns. For example, Carollo et al. (2019) used Danish register data and a twin design to study the causal impact of income on the age gap between marital partners. Moreover, examining how changing norms and roles are shaping the regularities we found would improve our understanding of changing gender relations. Overall, the findings presented in this paper are an example of the additional insights that can be gained from “bringing men back in” to the analysis of fertility (Goldscheider and Kaufman 1996).

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Data availability statement

Data and code are freely available on the Open Science Framework: <https://osf.io/a7r93/>

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